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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/038,680	01/08/2002	Yoshihiro Sotome	900-410	8985

7590 04/02/2003

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Arlington, VA 22201-4714

EXAMINER
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LEE, CALVIN

ART UNIT	PAPER NUMBER
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2825

DATE MAILED: 04/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/038,680

Applicant(s)

SOTOME, YOSHIHIRO

Examiner

Lee Calvin

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☐ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## OFFICE ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –  
(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the US before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the US before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the US only if the international application designated the US and was published under Article 21(2) of such treaty in English language.

2. Claims 1-12 are rejected under 35 U.S.C. 102(e) as being anticipated by *En et al.* (US 6,518,631).

a) *En* discloses a method of forming a semiconductor device, comprising the steps of:

- forming a first metal film 360, 362 having a reducing property on a semiconductor substrate
- thermal treating the substrate for reducing a native oxide film naturally formed on the substrate and for forming a first silicide 364, 366 thereon [Fig. 3E and col. 6]
- removing an unreacted first metal film (i.e., no layer 360, 362 on the gate spacers 368) [ln. 22]
- forming a second metal film 382, 384 of cobalt on the first silicide [Fig. 3F and col. 7]
- thermal treating the substrate for forming a second silicide 42, 44, 76 [Fig. 1] on the substrate surface, which includes a region where the first silicide has been formed

b) *In re* claim 2, since *En* suggests that “the first metal layer comprises any metal such as platinum, titanium, tantalum, nickel, cobalt, tungsten” [col. 6, ln. 4], and “a different metal could be formed overlying the first silicide” [col. 7, ln. 16], Examiner takes the position that *En* teaches forming a titanium film to be a first silicide of  $\text{TiSi}_2$ , followed by the formation of a second silicide of  $\text{CoSi}_2$  [col. 7, ln. 8].

c) *In re* claim 4, since *En* suggests that a thermal treatment is carried out at a temperature of from 200° to 700°, *En* inherently teaches or suggest that the thermal treatment for forming the first silicide is carried out at a temperature of 500° or less.

d) *In re* claims 5 and 6, *En* inherently teaches that both first and second metal films having a thickness of 1 to 10nm, because *En* does suggest that the thickness of either first silicide or second silicide is of about 2.5 to 20nm [col. 4]

***Claim Rejections - 35 U.S.C. § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over *En et al.* (US 6,518,631) in view of *Inuma et al.* (US 5,989,988).

a) *In re* claims 7 and 8, *En* does not teach the step of forming a titanium nitride film after the step of forming the second metal film. Nevertheless, such protection film formation is known in the semiconductor processing art as evidenced by *Inuma* disclosing that a titanium nitride film 9 is formed on the cobalt film 8 [Fig. 1B and col. 8, ln. 20].

It would have been obvious to one having skill in the art to have modified the process of *En* by utilizing a protective film on the metal film that is subjected to salicide for the purpose of obtaining the effect of improving the heat resistance of the silicide film [col. 11, ln. 44].

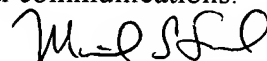
b) *In re* claim 9, *En* does not teach the step of oxidizing the substrate in a mixed solution of hydrochloric acid, hydrogen peroxide and water before the step of forming the first metal film. *Inuma* teaches or suggest that a substrate surface treatment (using a mixed solution of hydrochloric acid, hydrogen peroxide and water) results a thin native oxide film 30 uniformly formed on the metal film [col. 8, ln. 17].

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of *En* by utilizing a native oxide formation for the purpose of obtaining a single crystalline cobalt disilicide film [col. 11, lns. 27-33].

Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (703) 306-5854 from 7 to 17 ET (Monday through Thursday). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* can be reached at (703) 308-1323.

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The fax phones are (703) 872-9318 for regular communications and (703) 872-9319 for After-Final communications.

March 13, 2003



MATTHEW SMITH  
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